IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:	§	**Group Art Unit: 2168**
Rodgers et al.	§	
	§	**Confirmation No.: 5782**
Serial No.: 10/711,772	§	
	§	**Examiner: Dwivedi, Mahesh H.**
Filed: August 2, 2004	§	
	§	**Attorney Docket No. 04-0558**
Title: Queuing Syste with Mechanism to Limit Blocking of High-Priority Packets	§	
	§	
	§	
	§	

APPELLANT'S BRIEF (37 CFR § 41.37)

Mail Stop Appeal Brief-Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

A. INTRODUCTORY COMMENTS

This brief is submitted in furtherance of the Notice of Appeal filed in this case on May 19, 2007.

B. REAL PARTIES IN INTEREST

The real party in interest in this appeal is LSI Logic Corporation.

C. RELATED APPEALS AND INTERFERENCES

With respect to other appeals or interferences that will directly affect, or be directly affected by, or have a bearing on the Board's decision in the pending appeal, there are no such appeals or interferences.

D. STATUS OF CLAIMS

1. Total number of claims in application

The claims in the application are: 1-20

2. Status of all claims in application

- Claims canceled: None
- Claims withdrawn from consideration but not canceled: None
- Claims pending: 1-20
- Claims allowed: None
- Claims rejected: 1-20

3. Claims on appeal

The claims on appeal are: 1-20

E. STATUS OF AMENDMENTS

There are no unentered amendments in this case.

F. SUMMARY OF INDEPENDENT CLAIMS ON APPEAL

Independent claim 1 recites a method comprising:

receiving a plurality of queue items at an input queue (Para. 0031, Fig. 3, Ref. 302), wherein the input queue feeds a plurality of output queues (Paras. 0032-33, Fig. 4, Refs. 402-408) that feed one or more output ports (Paras. 0032-33, Fig. 4, Ref. 420), wherein each of the plurality of queue items has a corresponding queue item priority and a corresponding output port from the one or more output ports, and wherein each of the plurality of output queues at an output port has a corresponding queue priority;

determining whether a particular one of a plurality of output queues contains a number of queue items that meets or exceeds a pre-determined amount (Paras. 0034-35, Figs. 3-4, Refs. 410-416); and

in response to a determination that the particular one of the plurality of output queues contains a number of queue items that meets or exceeds the pre-determined amount, preventing any queue items that have a same corresponding output port as the particular one of the plurality of output queues and that have a queue item priority greater than or equal to the queue priority of the particular one of the plurality of output queues from exiting the input queue (Paras. 0034-36, Figs. 3-4, Refs. 306, 308).

Independent claim 7 recites a computer program product in a computer-readable medium, comprising functional descriptive material (Para. 0046) that, when executed by a computer, causes the computer to perform actions that include:

receiving a plurality of queue items at an input queue (Para. 0031, Fig. 3, Ref. 302), wherein the input queue feeds a plurality of output queues (Paras. 0032-33, Fig. 4, Refs. 402-408) that feed one or more output ports (Paras. 0032-33, Fig. 4, Ref. 420), wherein each of the plurality of queue items has a corresponding queue item priority and a corresponding output port from the one or more output ports, and wherein each of the plurality of output queues at an output port has a corresponding queue priority;

determining whether a particular one of a plurality of output queues contains a number of queue items that meets or exceeds a pre-determined amount (Paras. 0034-35, Figs. 3-4, Refs. 410-416); and

in response to a determination that the particular one of the plurality of output queues contains a number of queue items that meets or exceeds the pre-determined amount, preventing any queue items that have a same corresponding output port as the particular one of the plurality of output queues and that have a queue item priority greater than or equal to the queue priority of the particular one of the plurality of output queues from exiting the input queue (Paras. 0034-36, Figs. 3-4, Refs. 306, 308).

Independent claim 12 recites a queuing system comprising:

an input queue (Para. 0031, Fig. 3, Ref. 302); and

a plurality of output queues (Paras. 0032-33, Fig. 4, Refs. 402-408),

wherein each of the plurality of output queues is associated with a corresponding queue priority and a corresponding output port (Paras. 0032-33, Fig. 4, Ref. 420),

wherein each of the plurality of output queues receives queue items from a head of the input queue (Paras. 0032-33, Fig. 4), and

wherein if a particular one of the plurality of output queues contains a number of queue items that meets or exceeds a pre-determined amount (Paras. 0034-35, Figs. 3-4, Refs. 410-416), no queue items that have a same corresponding output port as the particular one of the plurality of output queues and that have a queue item priority that is greater than or equal to that of the particular one of the plurality of output queues are allowed to exit the input queue until the particular one of the plurality of output queues contains a number of queue items that is less than the pre-determined amount (Paras. 0034-36, Figs. 3-4, Refs. 306, 308).

G. ISSUES

1. Whether claims 1-17 and 19-20 are obvious under 35 U.S.C. § 103 in view of *Nakayama et al.* (U.S. Patent No. 6,907,001) and *Erimli et al.* (U.S. Patent 6,842,423).
2. Whether claim 18 are obvious under 35 U.S.C. § 103 in view of *Nakayama et al.* (U.S. Patent No. 6,907,001), *Erimli et al.* (U.S. Patent 6,842,423), and *Wynne et al.* (U.S. Patent 6,959,002).

H. ARGUMENT

Issue 1: 35 U.S.C. § 103, Obviousness, claims 1-17 and 19-20

The Examiner has rejected claims 1-17 and 19-20 under 35 U.S.C. § 103 as being obvious in view of *Nakayama et al.* (U.S. Patent No. 6,907,001) and *Erimli et al.* (U.S. Patent 6,842,423). This rejection is respectfully traversed.

A. Burden

The Office bears the burden of establishing a *prima facie* case of obviousness based on the prior art when rejecting claims under 35 U.S.C. § 103. *In re Fritch*, 972 F.2d 1260, 23

U.S.P.Q.2d 1780 (Fed. Cir. 1992). The Examiner has failed to meet that burden for the following reasons.

B. References must teach or suggest all elements of the rejected claims

For an invention to be prima facie obvious, the prior art must teach or suggest all claim limitations. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970).

With regard to independent claims 1, 7, and 12, the references fail to teach or suggest all elements of these claims. Specifically, independent claims 1, 7, and 12 recite a feature of "in response to a determination that the particular one of the plurality of output queues contains a number of queue items that meets or exceeds the pre-determined amount, preventing any queue items that have a same corresponding output port as the particular one of the plurality of output queues and **that have a queue item priority *greater than or equal to* the queue priority of the particular one of the plurality of output queues from exiting the input queue**" (emphasis added), which is neither taught nor suggested by the cited references.

The Examiner argues that this feature is taught by *Nakayama*, since after a particular threshold is reached in *Nakayama*, *all* packets are prevented from being transmitted to an output queue. The Examiner reasons that if *all* packets are prevented from being transmitted, then that would mean that packets greater than a particular priority would be suppressed in addition to packets of a lesser priority.

The problem with this argument is that it focuses on possible *results* of *Nakamura* and Appellants' invention, while ignoring *what the two inventions do* to obtain those results. Appellants' independent claims recite specific criteria utilized by the claimed invention to select which packets should not exit the input queue, namely that the packets have a priority **greater than or equal to** the queue priority of their destination output queue. In contrast, *Nakayama*, even where it teaches suppressing *all* packets (regardless of priority), applies the opposite criterion, that the priority is **less than** a particular amount. For example, *Nakayama,* if implemented in software, would use an "if" statement like the following to determine which packets to suppress:

if(packet_priority < x){ prevent packet from exiting }

In the above "if statement" the value of "x" determines whether some or all packets will be prevented from exiting the input queue. If the value "x" is greater than the highest priority allowed in the system, then all packets will be prevented from exiting, but if "x" is less than or equal to the highest priority allowed in the system, then only *lower priority* packets will be prevented from exiting the system.

A software implementation of the presently claimed invention, on the other hand, would use a very different sort of "if" statement to make this determination, such as this one:

if(packet_priority >= queue_priority) { prevent packet from exiting }

In this case, packets are prevented from exiting the input queue if they have a priority that is greater than or equal to the priority of the output queue. This is a different selection criterion than in *Nakayama*. Whether implemented in hardware or software, the implementation of this claim limitation will differ from that employed in *Nakayama*.

Testing for whether something is *greater than or equal to* a particular value (as recited in Appellants' independent claims) is, fundamentally, a different operation than testing for whether something is *less than* a particular value (as taught by *Nakayama*). While in certain special cases, it may be possible to obtain the same result from both operations (for example, testing to see if a number is greater than or equal to the lowest possible number will give the same result as testing to see if a number is less than or equal to the highest possible number), the operations performed will still be different.

As another example, consider a hypothetical scenario in which a reference teaches "generating a list of odd numbers greater than two and less than a given number" and the claims under examination recite "generating a list of *prime* numbers greater than two and less than a given number." In that case, it is clear that the operations being performed are different—testing a number to see if it is prime is *not* the same as testing the number to see if it is odd. This is true despite the fact that under certain special conditions, these two patentably distinguishable operations will yield the same result (*e.g.,* the odd numbers greater than 2 and less than 8 are all prime).

Appellants' claims, like all apparatus and method claims, define the invention in terms of *how the invention is made or practiced*—that is, the *structure* and *operation* of the invention. If Appellants claim something that applies a "greater than or equal to" relation and the prior art

teaches only something that applies a "less than" relation without teaching or suggesting the use of a "greater than or equal to" test or criterion, then the structure and operation of Appellants' invention and the prior art differ, even if it is possible to define a hypothetical situation in which the two inventions will yield identical results.

Moreover, the presently claimed invention also differs from the cited prior art in terms of what values are compared to determine which packets should not exit the input queue. Appellants' independent claims recite that these packets are those "that have a queue item priority **greater than or equal to the queue priority of the particular one of the plurality of output queues**." In the case of *Nakayama*, the Examiner has correctly noted that *Nakayama* does not teach output queues having a particular queue priority. The Examiner relies on *Erimli* as teaching queues having an associated queue priority. However, *Erimli* does not teach or suggest the limitation of preventing packets **having a priority greater than or equal to the output queue's priority** from exiting an input queue. The Examiner points to reference characters 312, 314, 316, and 318 in Figure 3 of *Erimli* as being output queues having associated queue priorities. However, in the event that one of the these queues becomes congested, *Erimli* teaches that **all** packets destined for any of queues 312, 314, 316, and 318 (which are all associated with a single output port) will be subject to flow control, regardless of what those packets' priority levels are. The circuit in Figure 4 of *Erimli*, for instance, performs a logical OR (reference symbol 430) of flow control signals from each of priority queues 312, 314, 316, and 318 to generate a flow control signal that applies to all four priority queues on a "per output port" basis. *See cols. 7 and 8* of *Erimli*. Thus, in *Erimli*, flow control is initiated on a "per output port" basis rather than on a particular packet's priority.

Thus, neither reference, whether considered apart or in conjunction with one another, teaches or suggests the claimed feature of preventing any queue items that have a same corresponding output port as the particular one of the plurality of output queues and **that have a queue item priority *greater than or equal to* the queue priority of the particular one of the plurality of output queues from exiting the input queue.**

Thus, independent claims 1, 7, and 12 are not obvious in view of the cited references. Similarly, dependent claims 2-6, 8-11, 13-17, and 19-20 are also non-obvious in view of the cited references, at least by virtue of their dependency on independent claims 1, 7, and 12.

Issue 2: 35 U.S.C. § 103, Obviousness, Claim 18

The Examiner has rejected claim 18 under 35 U.S.C. § 103 as being obvious in view of *Nakayama et al.* (U.S. Patent No. 6,907,001), *Erimli et al.* (U.S. Patent 6,842,423), and *Wynne et al.* (U.S. Patent 6,959,002). This rejection is respectfully traversed.

Claim 18 is a dependent claim that depends from independent claim 12. *Wynne* fails to cure the deficiencies of *Nakayama* with respect to the features of claim 12 that are contained in claim 18 by dependency. Specifically, *Nakayama* fails to teach or suggest the claimed feature of "in response to a determination that the particular one of the plurality of output queues contains a number of queue items that meets or exceeds the pre-determined amount, preventing any queue items that have a same corresponding output port as the particular one of the plurality of output queues **and that have a queue item priority greater than or equal to the queue priority of the particular one of the plurality of output queues from exiting the input queue**" (emphasis added). Thus claim 18 is patentable over the cited references for at least the reasons set forth with respect to independent claim 12.

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I. APPENDIX OF CLAIMS

1. A method comprising:

receiving a plurality of queue items at an input queue, wherein the input queue feeds a plurality of output queues that feed one or more output ports, wherein each of the plurality of queue items has a corresponding queue item priority and a corresponding output port from the one or more output ports, and wherein each of the plurality of output queues at an output port has a corresponding queue priority;

determining whether a particular one of a plurality of output queues contains a number of queue items that meets or exceeds a pre-determined amount; and

in response to a determination that the particular one of the plurality of output queues contains a number of queue items that meets or exceeds the pre-determined amount, preventing any queue items that have a same corresponding output port as the particular one of the plurality of output queues and that have a queue item priority greater than or equal to the queue priority of the particular one of the plurality of output queues from exiting the input queue.

2. The method of claim 1, wherein the pre-determined amount is a capacity of the particular one of the plurality of output queues.

3. The method of claim 1, wherein the queue items are packets in a packet-switching fabric.

4. The queuing system of claim 3, wherein, upon exit of a packet from one of the plurality of output queues, the packet is transmitted over the packet-switching fabric.

5. The method of claim 1, wherein if any of the plurality of output queues contains a number of queue items that meets or exceeds the pre-determined amount, no queue items are allowed to exit the input queue until all of the plurality of output queues contain numbers of queue items that are less than the pre-determined amount.

6. The method of claim 5, wherein the pre-determined amount is a capacity of the particular one of the plurality of output queues.

7. A computer program product in a computer-readable medium, comprising functional descriptive material that, when executed by a computer, causes the computer to perform actions that include:

receiving a plurality of queue items at an input queue, wherein the input queue feeds a plurality of output queues that feed one or more output ports, wherein each of the plurality of queue items has a corresponding queue item priority and a corresponding output port from the one or more output ports, and wherein each of the plurality of output queues at an output port has a corresponding queue priority;

determining whether a particular one of a plurality of output queues contains a number of queue items that meets or exceeds a pre-determined amount; and

in response to a determination that the particular one of the plurality of output queues contains a number of queue items that meets or exceeds the pre-determined amount, preventing any queue items that have a same corresponding output port as the particular one of the plurality of output queues and that have a queue item priority greater than or equal to the queue priority of the particular one of the plurality of output queues from exiting the input queue.

8. The computer program product of claim 7, wherein the pre-determined amount is a capacity of the particular one of the plurality of output queues.

9. The computer program product of claim 7, wherein the queue items are packets in a packet-switching fabric.

10. The computer program product of claim 9, wherein, upon exit of a packet from one of the plurality of output queues, the packet is transmitted over the packet-switching fabric.

11. The computer program product of claim 7, wherein if any of the plurality of output queues contains a number of queue items that meets or exceeds the pre-determined amount, no queue items are allowed to exit the input queue until all of the plurality of output queues contain numbers of queue items that are less than the pre-determined amount.

12. A queuing system comprising:

an input queue; and

a plurality of output queues,

wherein each of the plurality of output queues is associated with a corresponding queue priority and a corresponding output port,

wherein each of the plurality of output queues receives queue items from a head of the input queue, and

wherein if a particular one of the plurality of output queues contains a number of queue items that meets or exceeds a pre-determined amount, no queue items that have a same corresponding output port as the particular one of the plurality of output queues and that have a queue item priority that is greater than or equal to that of the particular one of the plurality of output queues are allowed to exit the input queue until the particular one of the plurality of output queues contains a number of queue items that is less than the pre-determined amount.

13. The queuing system of claim 12, wherein the pre-determined amount is a capacity of the particular one of the plurality of output queues.

14. The queuing system of claim 12, wherein the queue items are packets in a packet-switching fabric.

15. The queuing system of claim 14, wherein, upon exit of a packet from one of the plurality of output queues, the packet is transmitted over the packet-switching fabric.

16. The queuing system of claim 12, wherein if any of the plurality of output queues contains a number of queue items that meets or exceeds the pre-determined amount, no queue items are allowed to exit the input queue until all of the plurality of output queues contain numbers of queue items that are less than the pre-determined amount.

17. The queuing system of claim 16, wherein the pre-determined amount is a capacity of the particular one of the plurality of output queues.

18. The queuing system of claim 12, wherein the queuing system is implemented as a logic circuit.

19. The queuing system of claim 12, wherein each of the plurality of output queues receives only those queue items that have a queue item priority that matches the queue priority of that output queue.

20. The queuing system of claim 19, wherein no queue item may exit one of the plurality of output queues if there is a non-empty higher-priority output queue.

J. APPENDIX OF EVIDENCE SUBMITTED UNDER 37 CFR 1.130, 1.131, OR 1.132

None.

K. APPENDIX OF DECISIONS IN RELATED PROCEEDINGS

None.